



BIOrescue:

A novel biorefinery concept for mushroom compost

www.biorescue.eu

BIODEGRADABLE NANOCARRIERS FOR TARGETED PLANT TREATMENT

Frederik Wurm

Max Planck Institute for Polymer Research, Mainz, Germany.

www.chemistry-is-life.de

TOWARDS A CIRCULAR BIOECONOMY IN SPANISH INDUSTRY. 11 OCTOBER. MADRID.

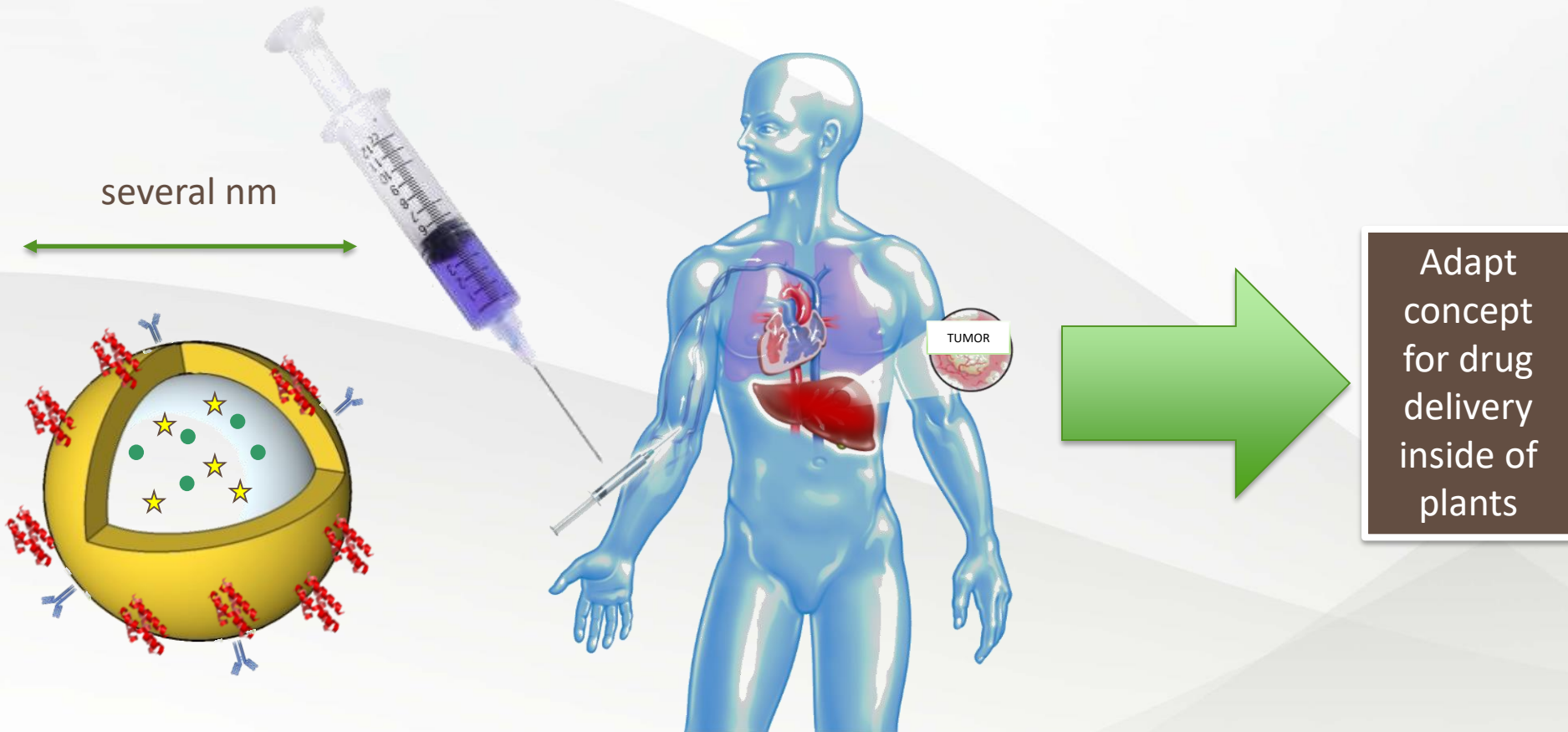


Spraying in agriculture
2.5 mio t/ year pesticides



Drug delivery system – „the magic bullet“

A degradable nanocarrier that only recognizes the target cells *in vivo*





Esca – A worldwide disease in grapevine plants

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Photo taken in Rheingau (Eltvile, Germany), 2018

This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 720708



Horizon 2020
European Union Funding
for Research & Innovation



Esca – A worldwide disease in grapevine plants

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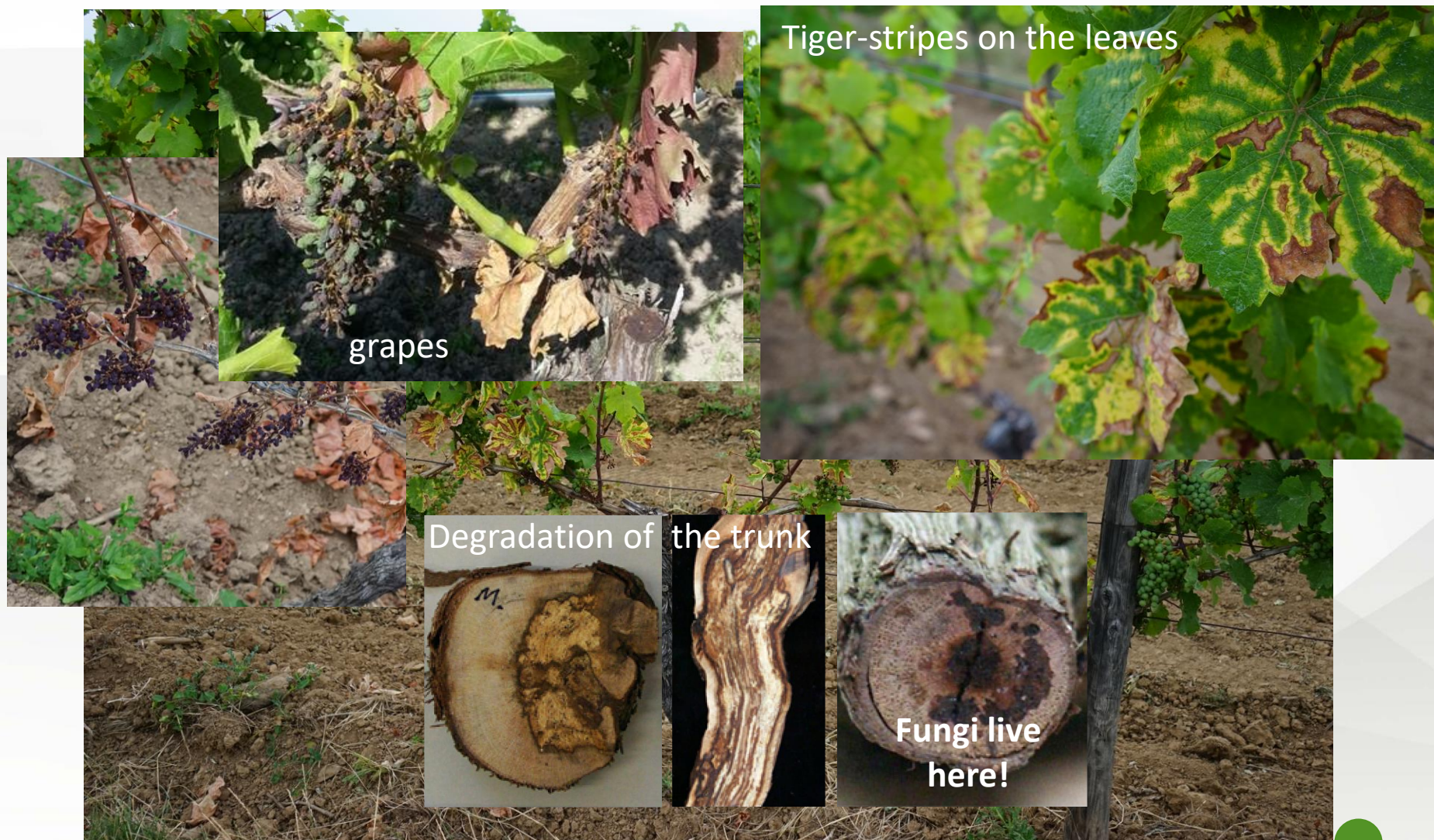


Photo taken in Rheingau (Eltville, Germany), 2018

And Biologische Bundesanstalt für Land- und Forstwirtschaft

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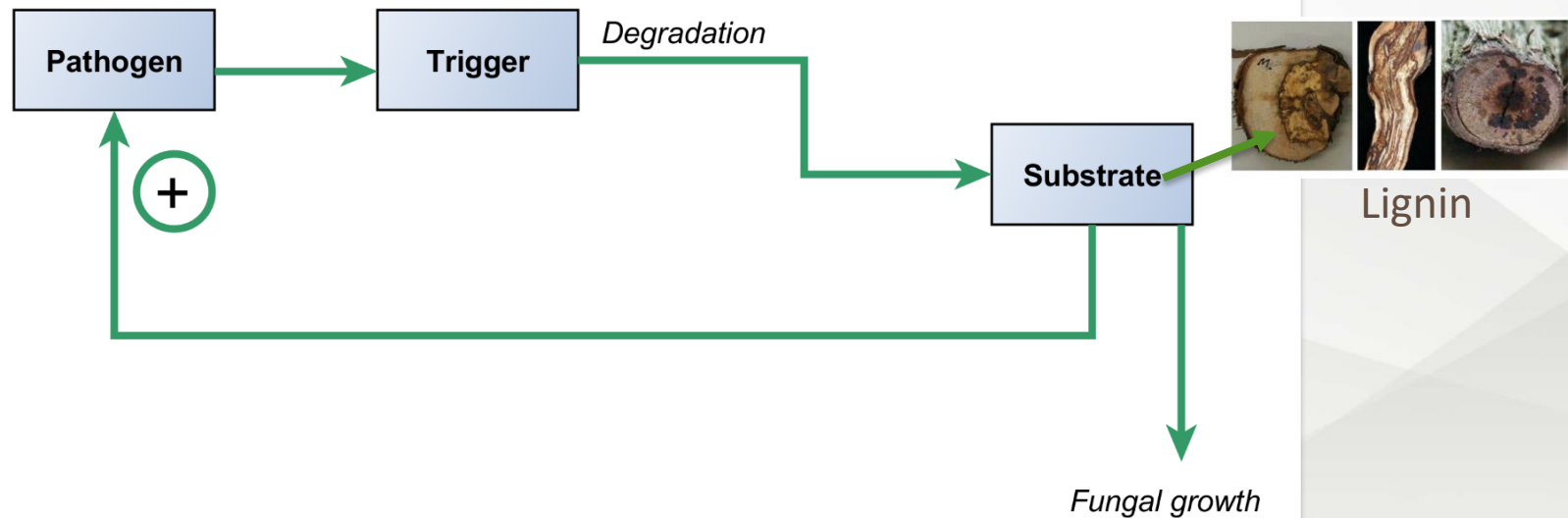


Horizon 2020
European Union Funding
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Esca – A worldwide disease in grapevine plants -mechanism



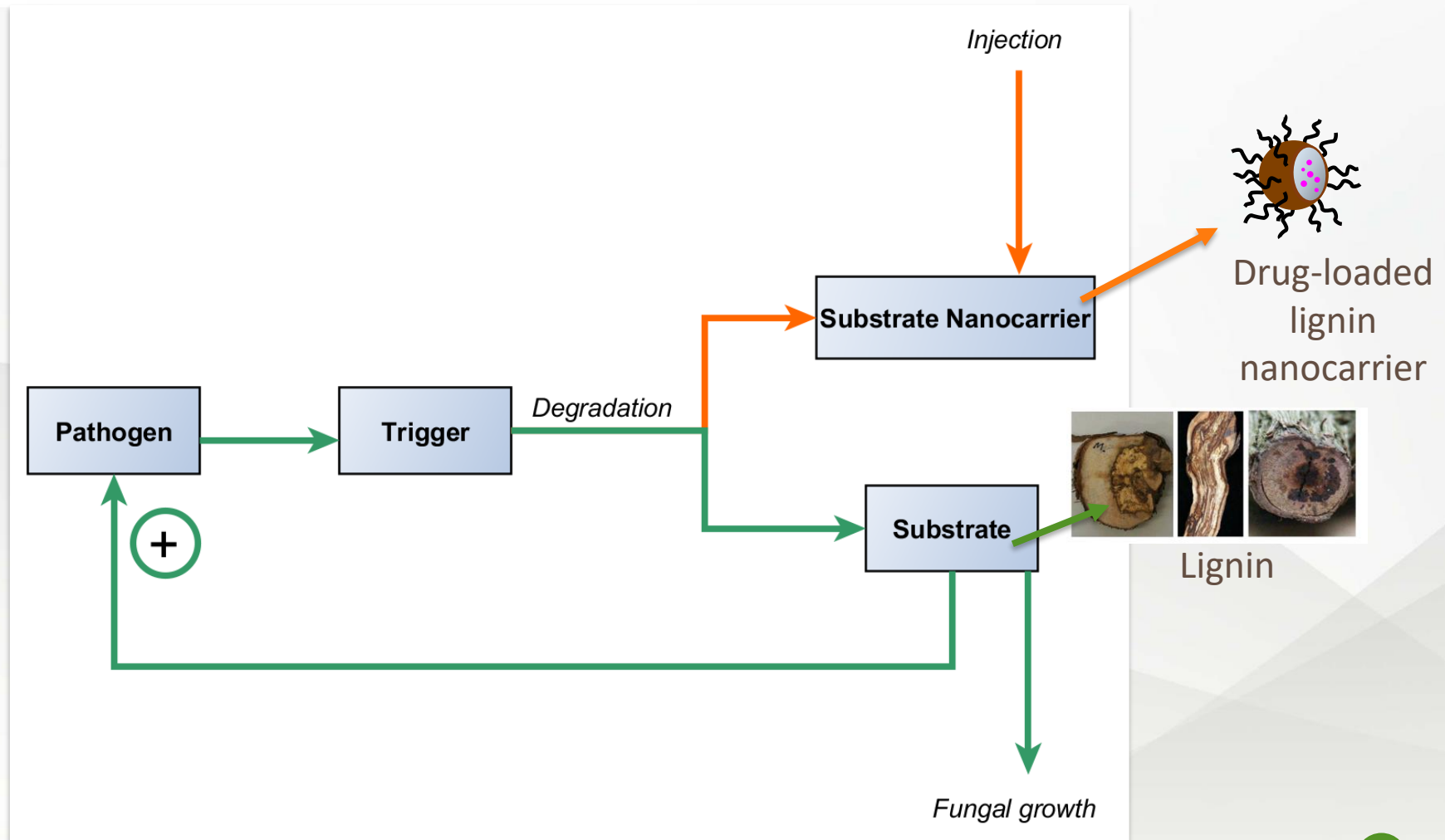
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Esca – A worldwide disease in grapevine plants -mechanism



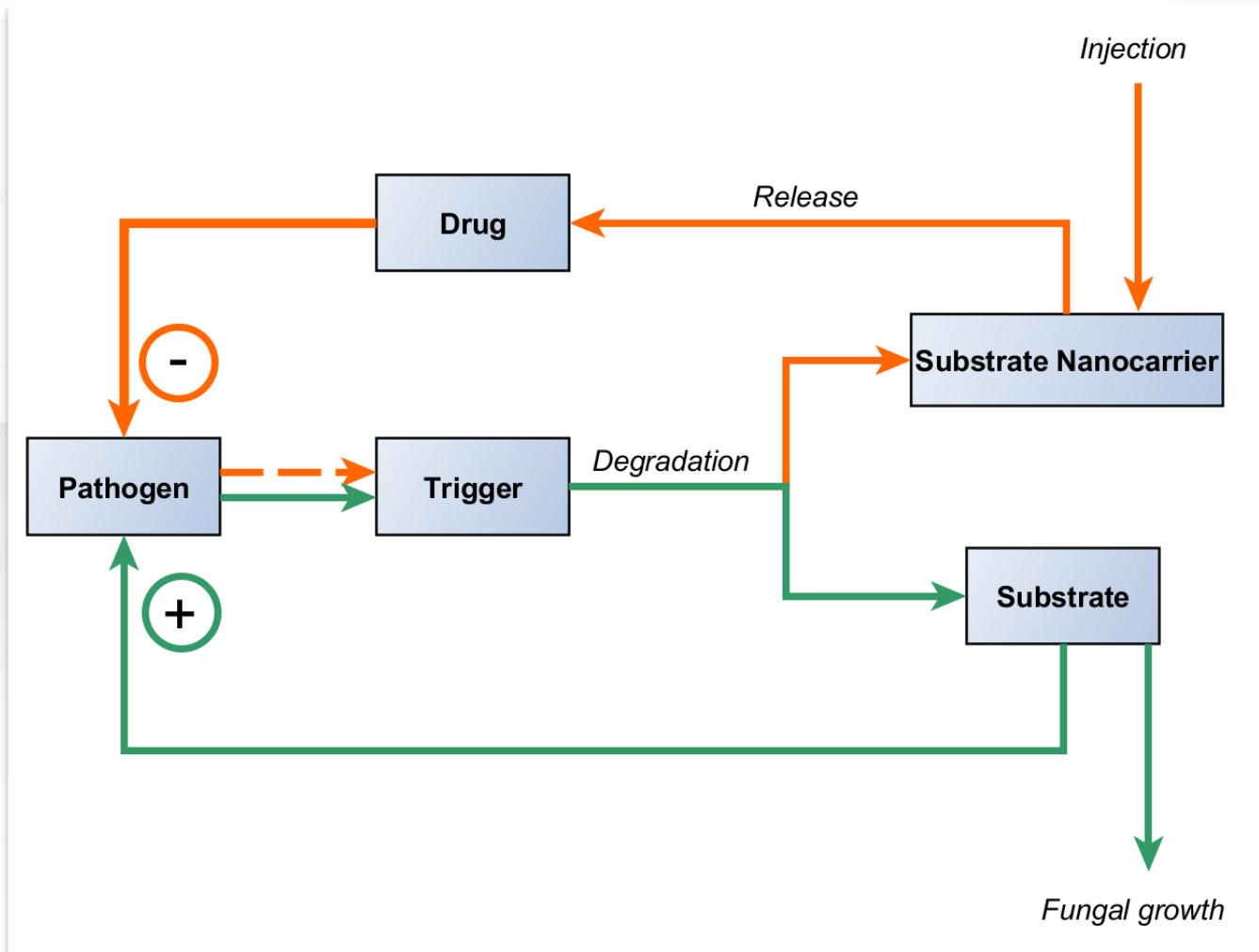
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Esca – A worldwide disease in grapevine plants -mechanism



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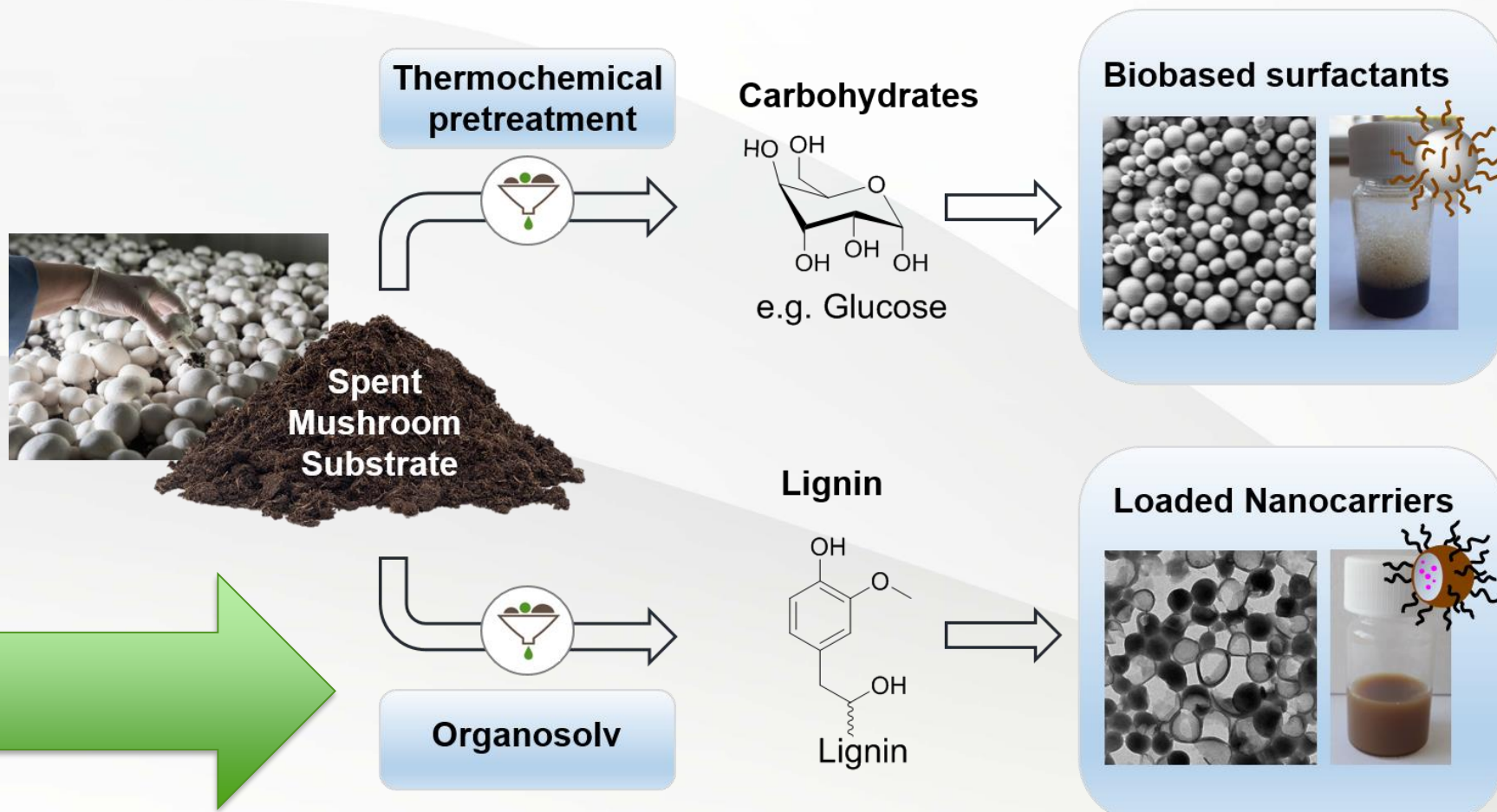


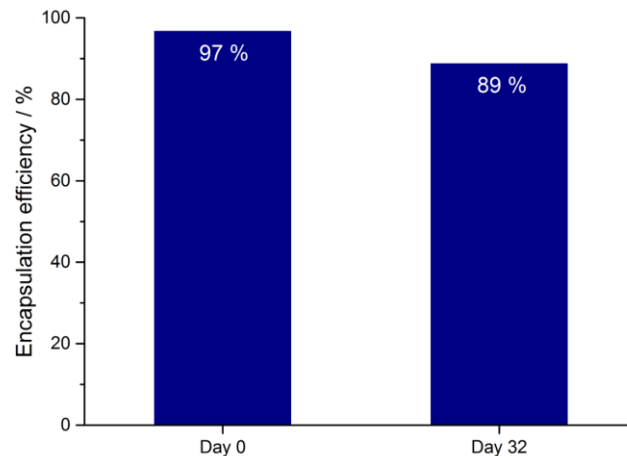
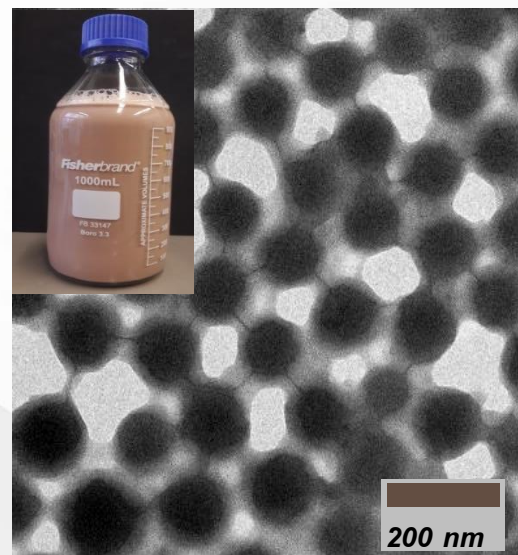
A negative feedback loop for drug delivery



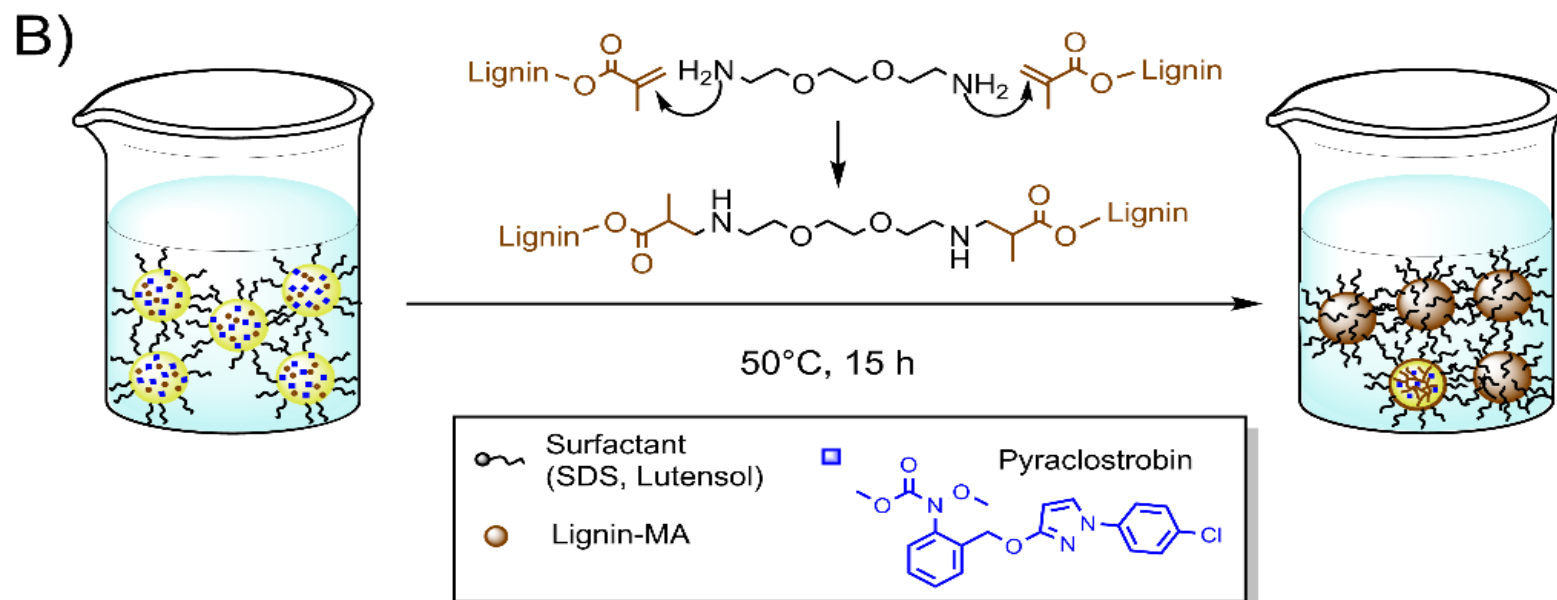
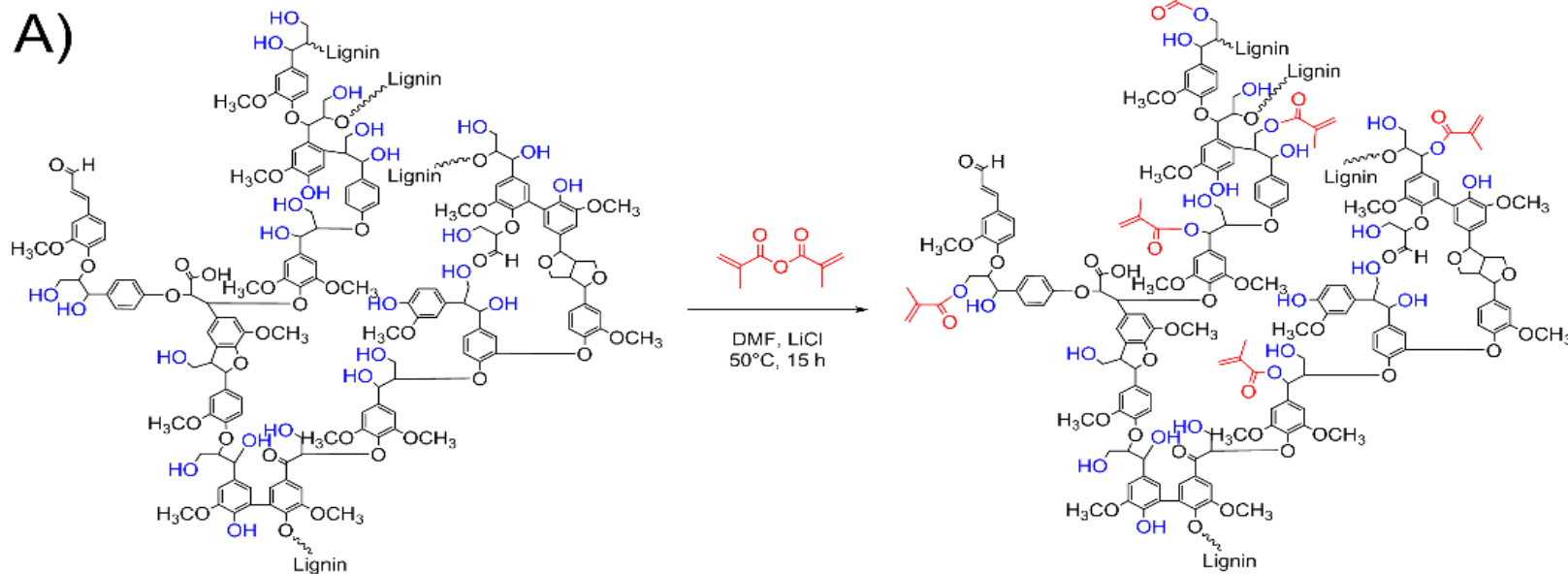
The building blocks for nanocarriers come from SMS

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- Emulsion polymerization to encapsulate drugs
- High encapsulation (>90%), retains drug
- Enzymatic degradation by fungal enzymes



IN VITRO - INHIBITION OF SPORE GERMINATION AND GROWTH

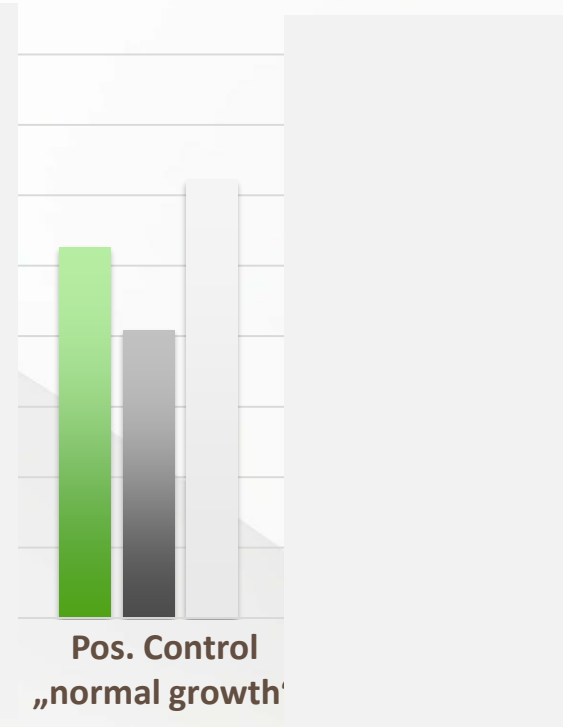
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Fungal growth
18 days



Optical density 600

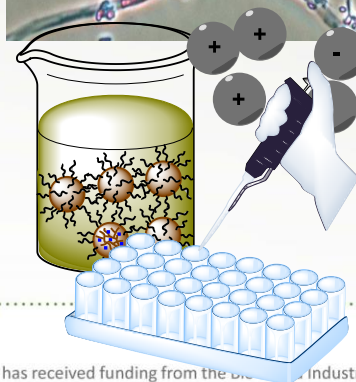
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0



Isolation of
conidia



Harvesting
conidia & NP



■ Phaemoniella Chlamydophora

■ Phaeoacremonium minimum

■ Eutypa lata

Esca fungi: produce lignases

Esca fungus:
No lignase production

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DR. FISCHER, IBWF KAISERSLAUTERN



Esca: Fungal disease

Over 2 billion wine plants
infected – worldwide

no cure!

**First curative
treatment against
the fungal disease
Esca!**



Degradable nanocarrier dispersion

part of **BIO
RESCUE**
H2020 project

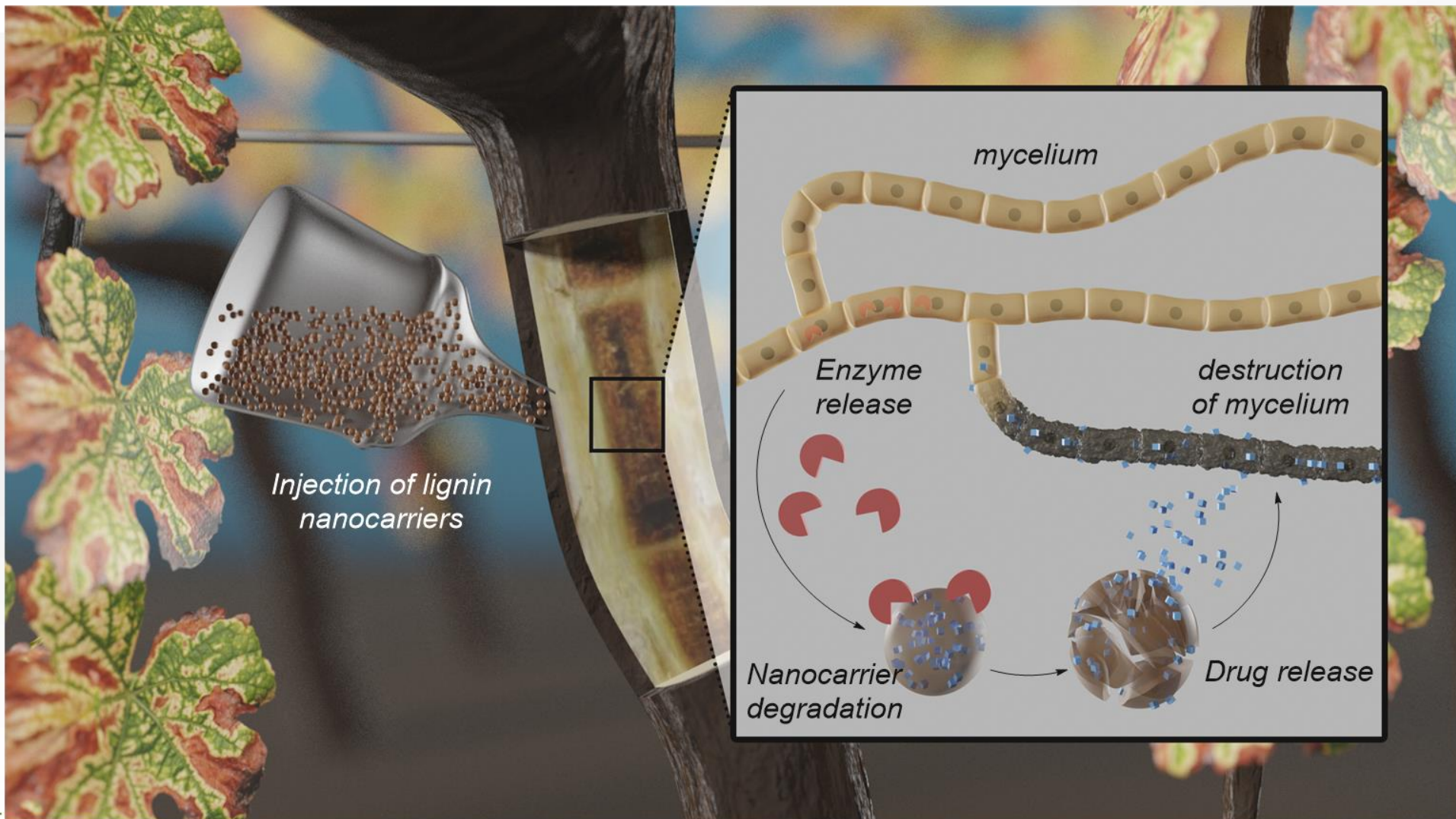
from the Bio Based Industries Joint Undertaking under
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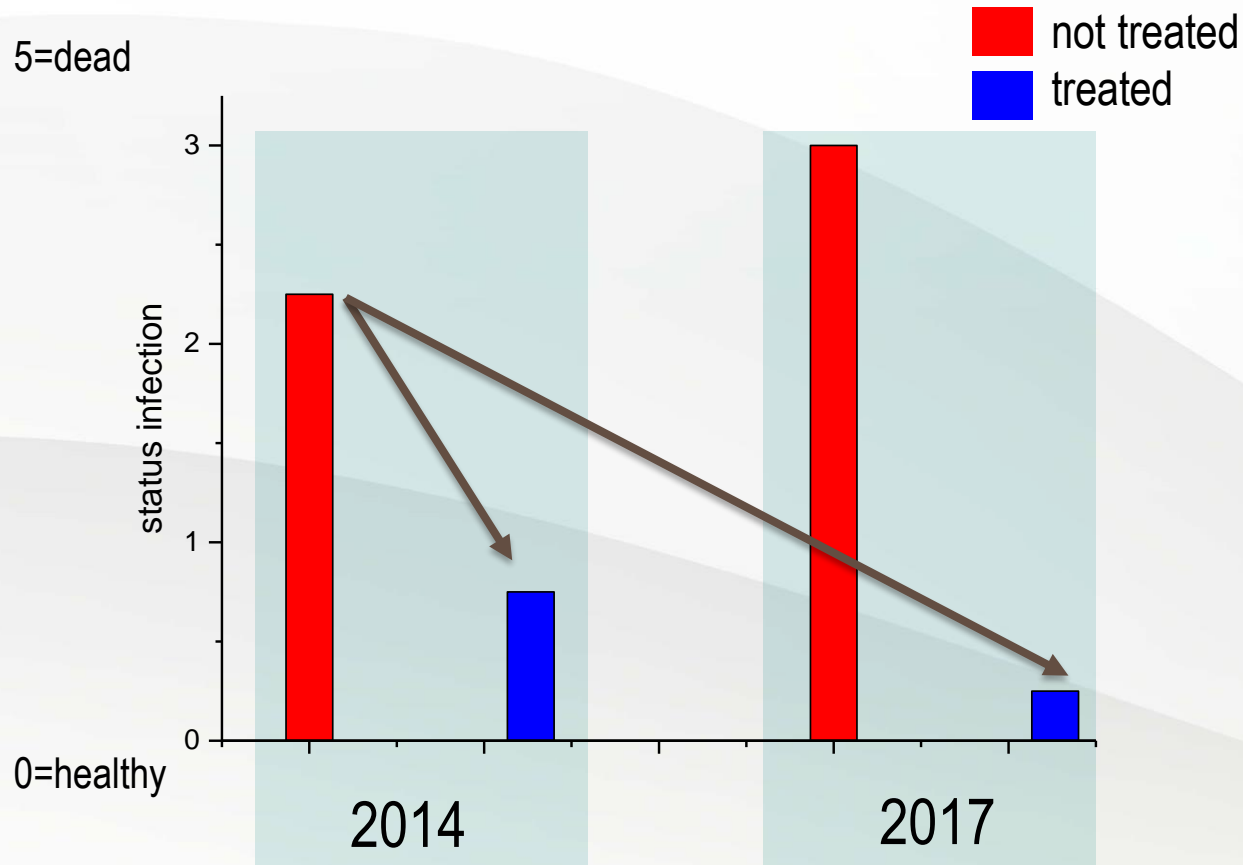
Thines, Fischer, Yiamsawas, Landfester, **Wurm**, WO2017134308 A1



INSTITUT FÜR BIOTECHNOLOGIE
UND WIRKSTOFF-FORSCHUNG







Field trials 5/2018 in Neustadt

Single dose of less than 10 mg drug per plant



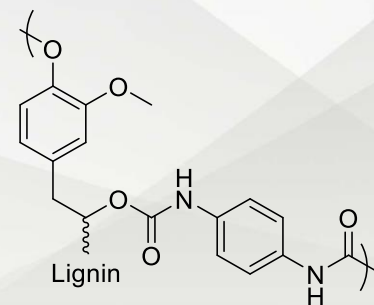
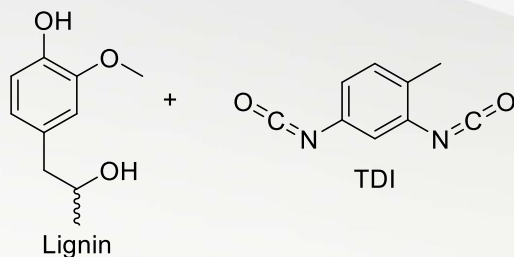
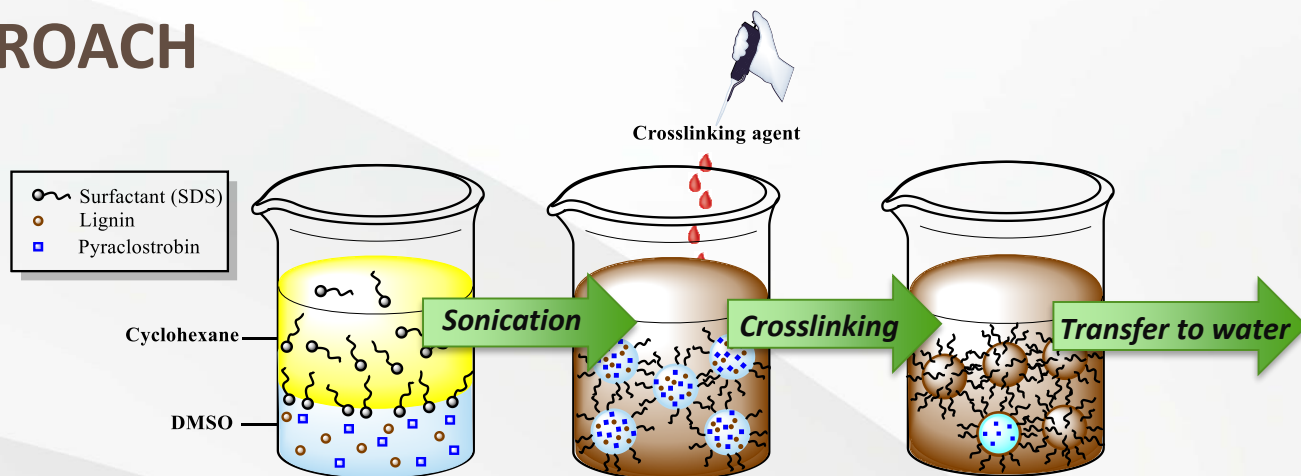
BIODEGRADABLE LIGNIN NANOCARRIERS – REVERSE APPROACH

Continuous phase

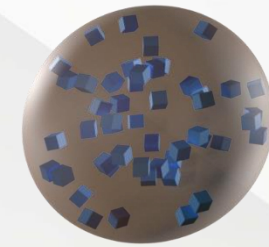
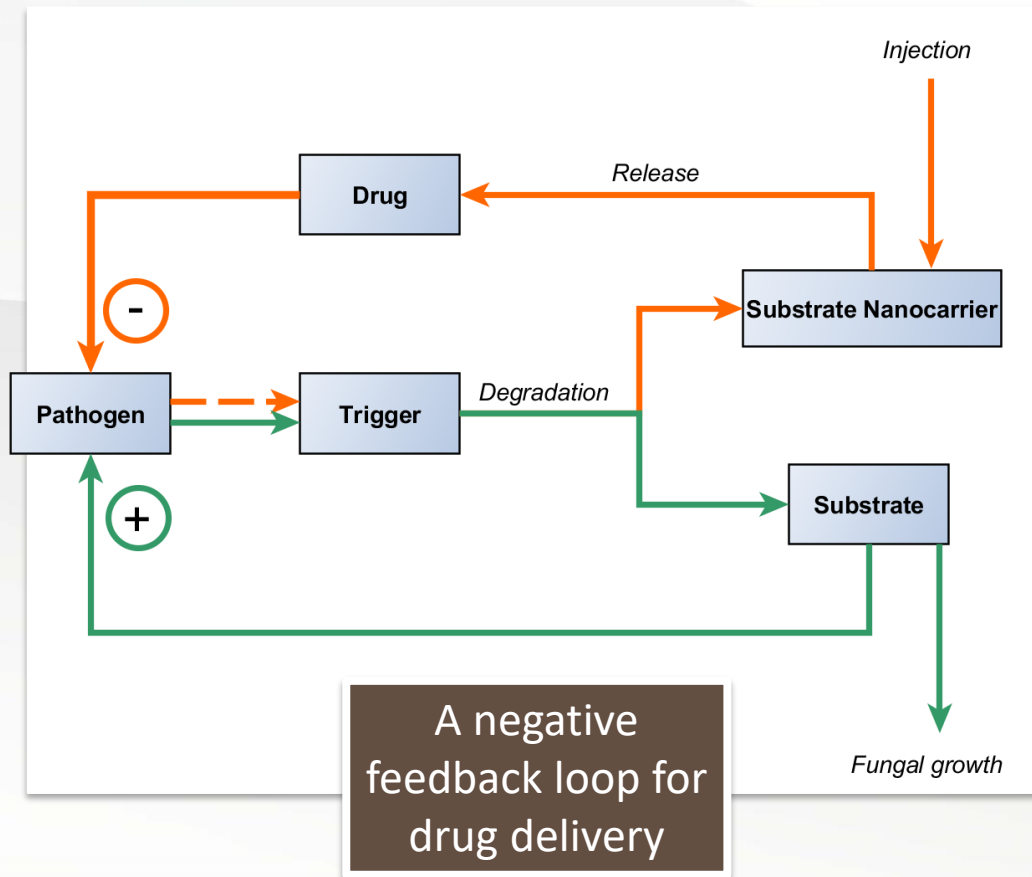
Cyclohexane

Dispersed phase

DMSO



BIODEGRADABLE NANOCARRIERS BASED ON LIGNIN



ACKNOWLEDGEMENTS

The whole BioRescue Consortium

„Lignin Team“:

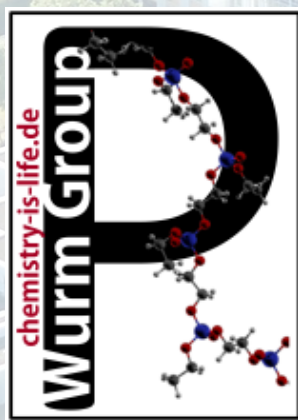
Sebastian Beckers

Stefan Peil

Dr. Jochen Fischer (IBWF, Kaiserslautern)

Dr. Andreas Kortekamp (DLR, Neustadt)

**BIO
RESCUE**



Current Group:

Sebastian Beckers
Sabrina Brand
Tassilo Gleede
Tobias Haider
Natkritta Hüppe
Katja Klein
Angelika Manhart
Jens Markwart
Stefan Peil

Chiara Pelosi
Timo Rheinberger
Elisabeth Rieger
Hisaschi Tee
Dr. Seong-Min Jo
Dr. Biao Kang
Dr. Emeline Rideau

Group

€



FONA
Forschung für nachhaltige
Entwicklungen
BMBF

Max Planck Graduate Center
mit der Johannes Gutenberg-Universität Mainz



MAX-PLANCK-GESELLSCHAFT



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UNIVERSITÄT MAINZ

**MATERIALS
IN
SCIENCE**
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Alexander von Humboldt
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MAX PLANCK RESEARCH NETWORK
IN SYNTHETIC BIOLOGY



Group Wine Tasting 2018